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Physics 11 Assignment Probe
Chapter 2 – Describing Motion

Physicist: KEY

Learning Targets Covered (I can...):

- express the constant velocity of an object using narrative, mathematical, and graphical representations.
- design an experimental investigation of the constant velocity or acceleration of an object.
- analyze experimental data describing the constant velocity of an object and express the results of the analysis using narrative, mathematical, and graphical representations.
- express the constant acceleration of an object using narrative, mathematical, and graphical representations.
- express the constant acceleration of a falling object using equations.

Instructions:

- ***Shade in the bubble that most appropriately answers each multiple choice question***
- ***Answer the following questions in the space provided.***
- ***Show all formulas and work.***
- ***Pay attention to appropriate units and number of significant digits.***

I. Multiple Choice (10 points)

1. A vector has ____. a. magnitude only b. direction only. c. both magnitude and direction	a b **c**
2. Which of the following is an example of a scalar? a. distance b. velocity c. acceleration d. displacement	**a** b c d
3. The change in an object's position is defined as ____. a. distance b. displacement c. acceleration d. speed	a **b** c d
4. Which of the following is the appropriate definition of speed? a. speed = distance / time b. speed = displacement / time c. speed = time / displacement d. speed = time / distance	**a** b c d
5. Acceleration is the rate of change of _____. a. speed with respect to time b. velocity with respect to time c. displacement with respect to time d. velocity with respect to displacement	**a** **b** c d
6. The slope of a tangent line at a point on a position-time graph describes the ____ at that point. a. average velocity b. average speed c. instantaneous velocity d. instantaneous speed	a b **c** d
7. The slope of a tangent line at a point on a velocity-time graph describes the ____ at that point. a. average acceleration b. average speed c. instantaneous acceleration d. change in displacement	a b **c** d
8. The area under an acceleration-time graph describes ____. a. an object's displacement b. an object's change in velocity c. instantaneous velocity d. instantaneous acceleration	a **b** c d
9. Which of the following statements describes the 'positive acceleration' of an object? a. An object speeds up in a positive direction. b. An object speeds up in a negative direction. c. An object slows down in a positive direction. d. An object moves with constant speed in the same direction.	**a** b c d

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10. A ball is thrown straight upwards by someone's hand and caught by the same hand. At what point is the ball's speed zero? a. When the ball lands in the hand b. When the ball is halfway between the hand and the maximum height c. When the ball is released from the hand d. When the ball is at the maximum height	a b c **d**

II. Shor Answer (28 points) SHOW ALL WORK!!!

11. A polar bear meanders 275 m east and then turns around and ambles 425 m west.

a. What was the distance travelled by the bear? (3)

$275\ m + 425\ m = 700\ m$

b. What is the bear's displacement? (3)

$-425\ m + 275\ m = -150\ m\ [W]$

12. If a snowboarder is traveling at 8.0 m/s, how long will it take her to reach 36.0 m/s if she can accelerate at a rate of 3.5 m/s^2? (3)

$a = \frac{\Delta v}{\Delta t}$

$\Delta t = \frac{v_f - v_i}{a} = \frac{36.0\ m/s - 8.0\ m/s}{3.5\ m/s^2} = \boxed{8.0\ s}$

13. A supersonic jet traveling at 2.00×10^2 m/s [E] is accelerated uniformly from at a rate of 23.1 m/s^2 [E] for 20.0 s. What is the jet's final speed? (3)

$v_f = v_i + at$

$v_f = 200\ m/s + (23.1\ m/s^2)(20.0\ s)$

$\boxed{v_f = 662\ m/s\ [E]}$

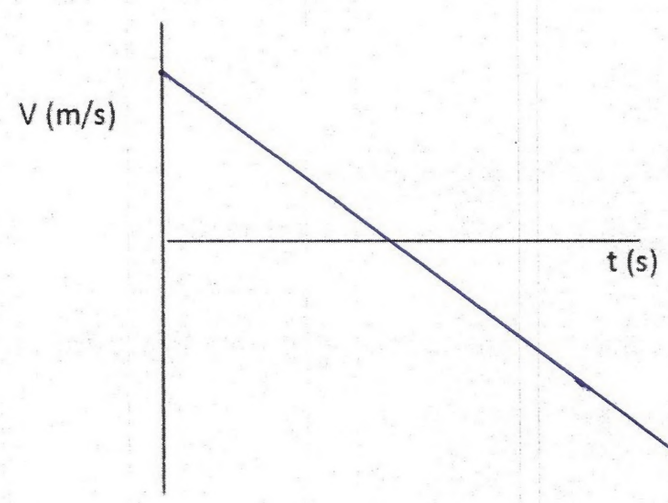
14. An engineer is to design a runway to accommodate airplanes that must gain a ground speed of 360 km/h (or 100 m/s) before they can take off. These planes are capable of being accelerated uniformly at a rate of 2.78 m/s^2. How many meters long must the runway be? (3)

$v_f^2 = v_i^2 + 2ad$

$d = \frac{v_f^2}{2a} \Rightarrow d = \frac{(100\ m/s)^2}{2(2.78\ m/s^2)} = 1799\ m \doteq 1800\ m$

15. Sketch the velocity-time graph for the following situation: (2)

A football is kicked straight up and then falls back down



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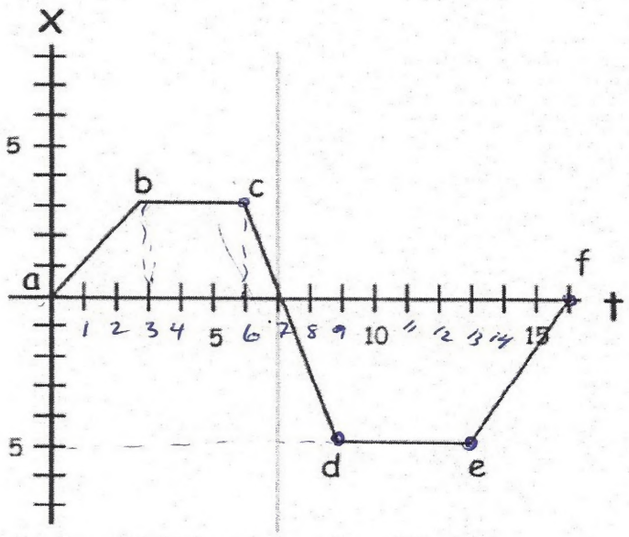
16. A car travels along a straight section of road. A distance vs. time graph illustrating its motion is graphed below:



a. Indicate every time interval, t, for which the car is at rest. (2)

3–6 s, 9–13 s
b-c d-e.

b. What is the velocity from: **c-d** & **e-f** (6) SHOW ALL WORK!!!

c-d:

$$v = \frac{-5\,m - 3\,m}{9\,s - 6\,s} = \frac{-8\,m}{3\,s} \doteq -2.67\ m/s$$

e-f:

$$v = \frac{0\,m - (-5\,m)}{16\,s - 13\,s} = \frac{5\,m}{3\,s} = +1.67\ m/s$$

17. A heavy rock is dropped from rest at the top of a cliff and falls 150 m before hitting the ground. What is the rock's velocity before it hits the ground? (3)

$$v_f^2 = v_i^{2\,0} + 2gd$$

$$v_f = \sqrt{2gd}$$

$$v_f = \sqrt{2(-9.8\ m/s^2)(150\ m)} = \boxed{-54.2\ m/s}$$